Sustaining Massachusetts' Water Resources through Water-Use Efficiency and Watershed Offsets

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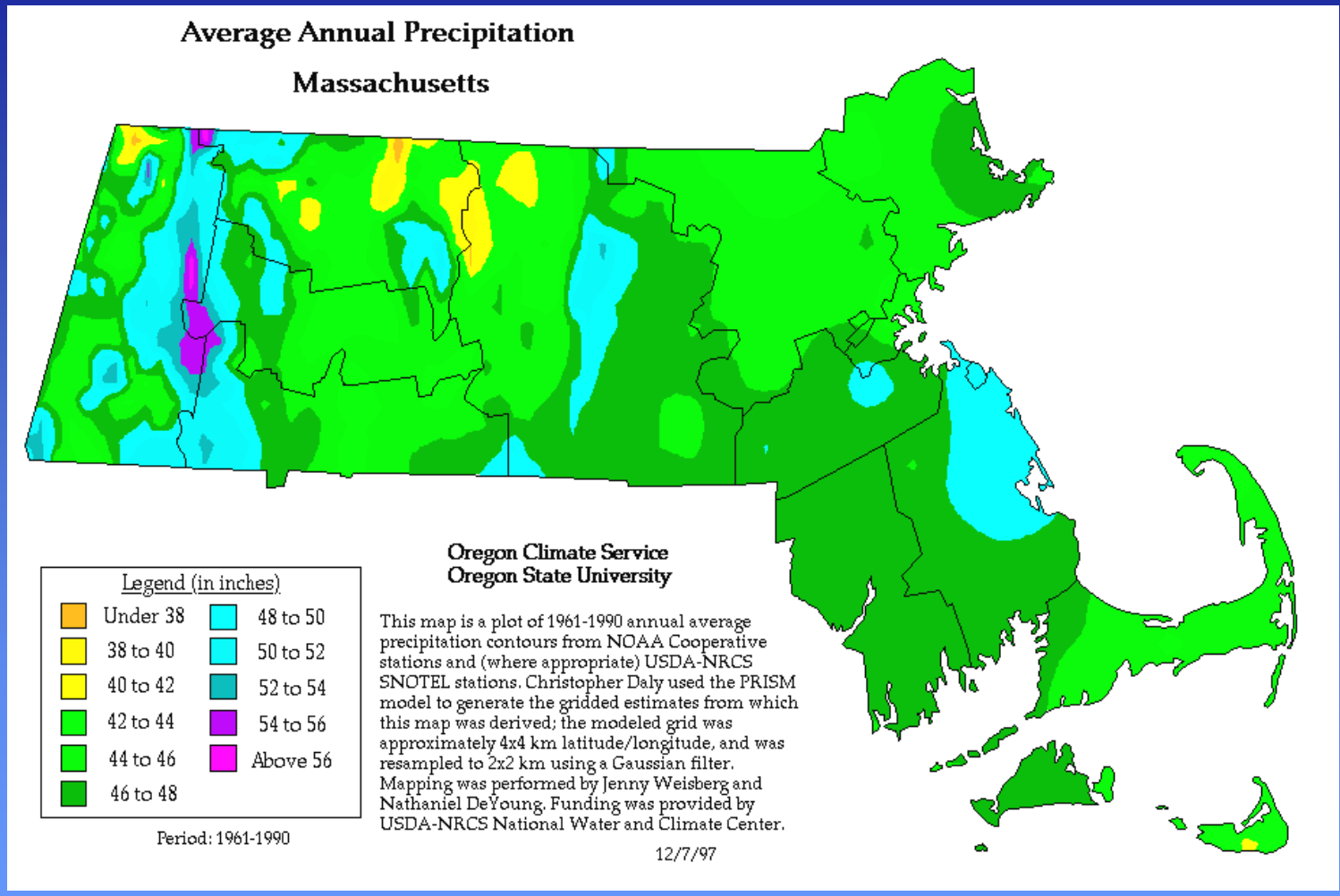
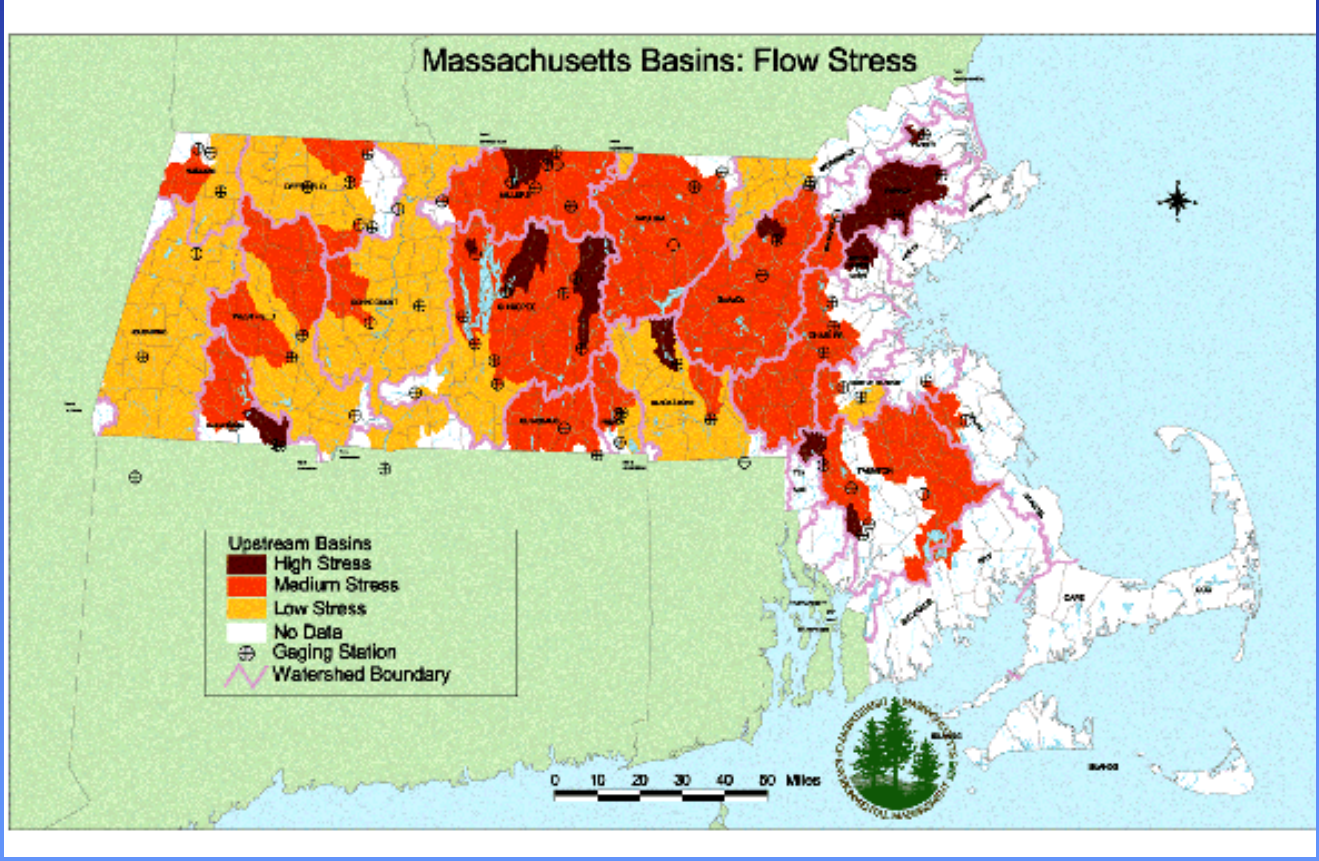
MassDEP Boston
Bureau of Resource Protection

Saving money while addressing supply needs for future growth and the environment

Rainfall Yearly Average

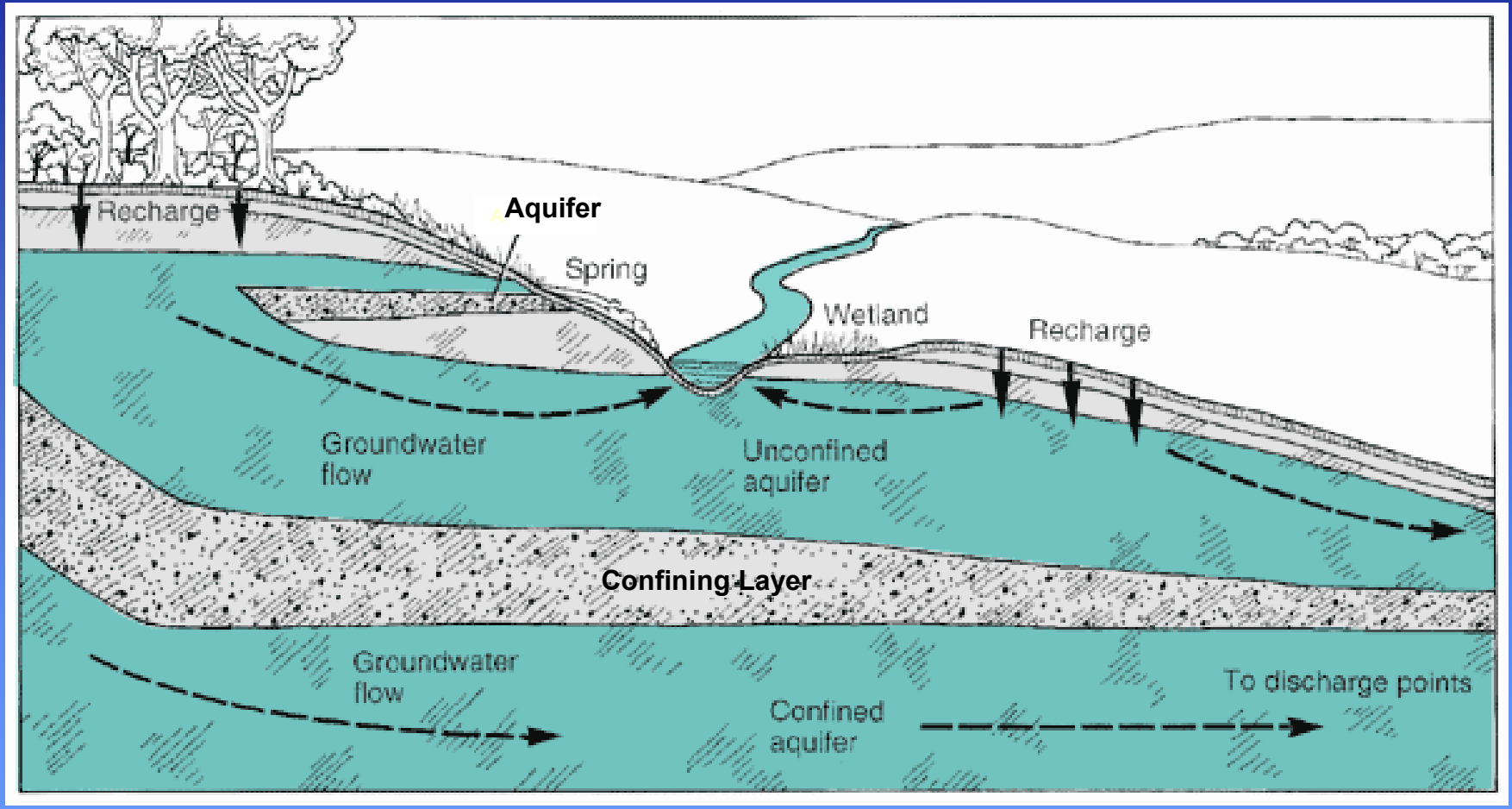


Stressed Basins

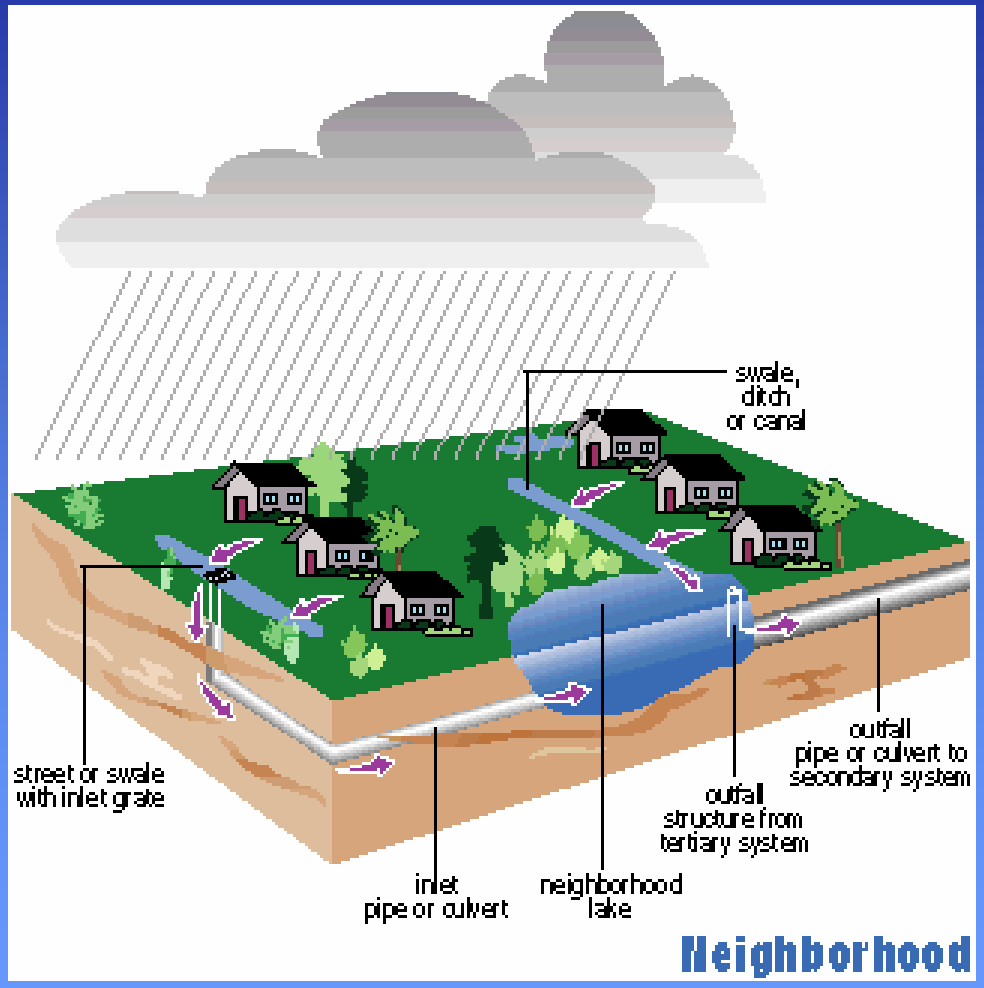


- 16 High Stress
- 36 Medium Stress
- 18 Low Stress
- Unassessed: mostly coastal basins

Surface Water & Groundwater



Watershed Hydrologic Cycle Imbalance



Factors Affecting a Balanced Watershed Hydrologic Cycle

Towns with Sewer Systems

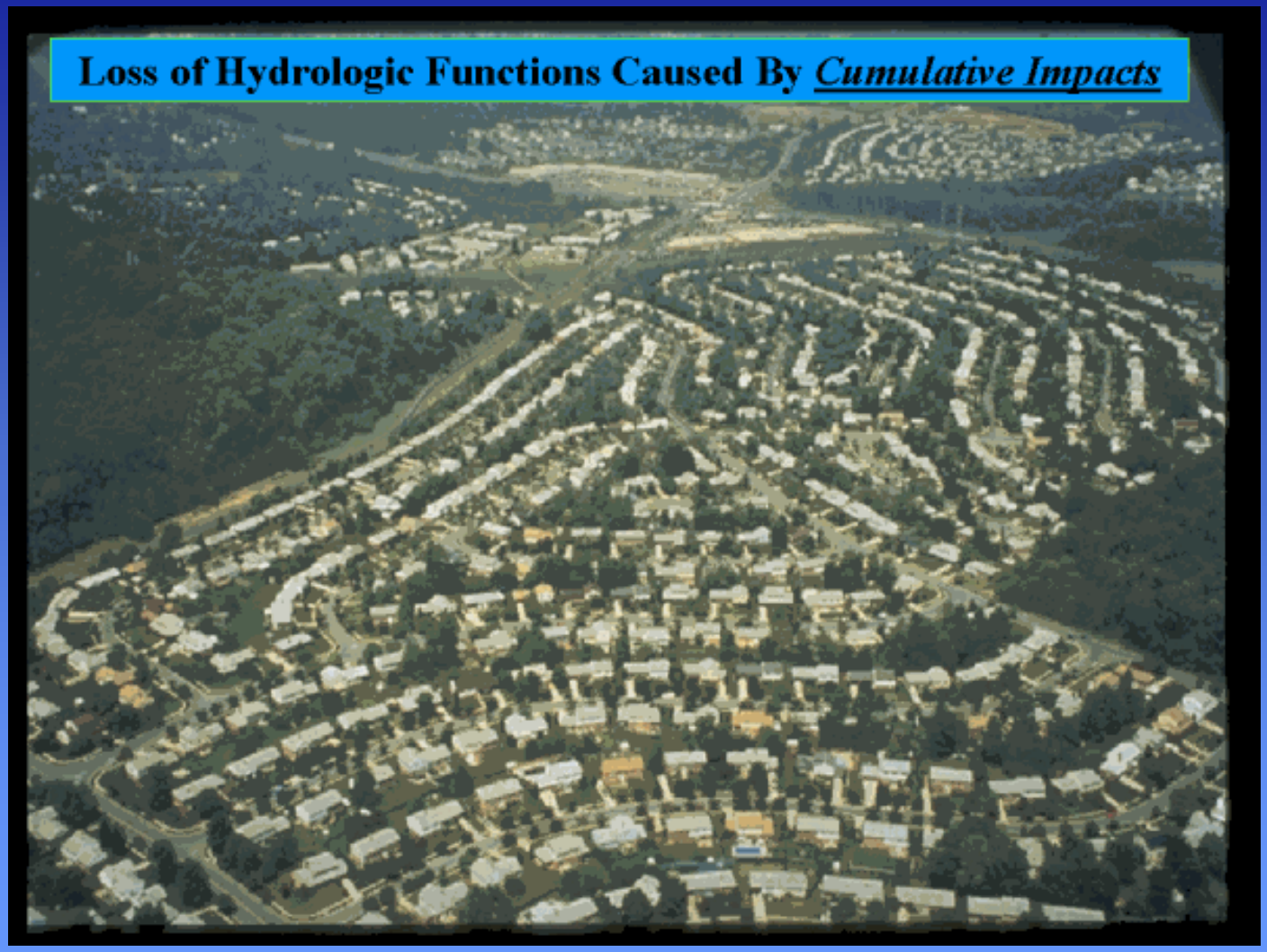
- Reductions of groundwater elevations when groundwater enters municipal sewer collection

Factors affecting a Balanced Watershed Hydrologic Cycle

Towns with Sewer Systems

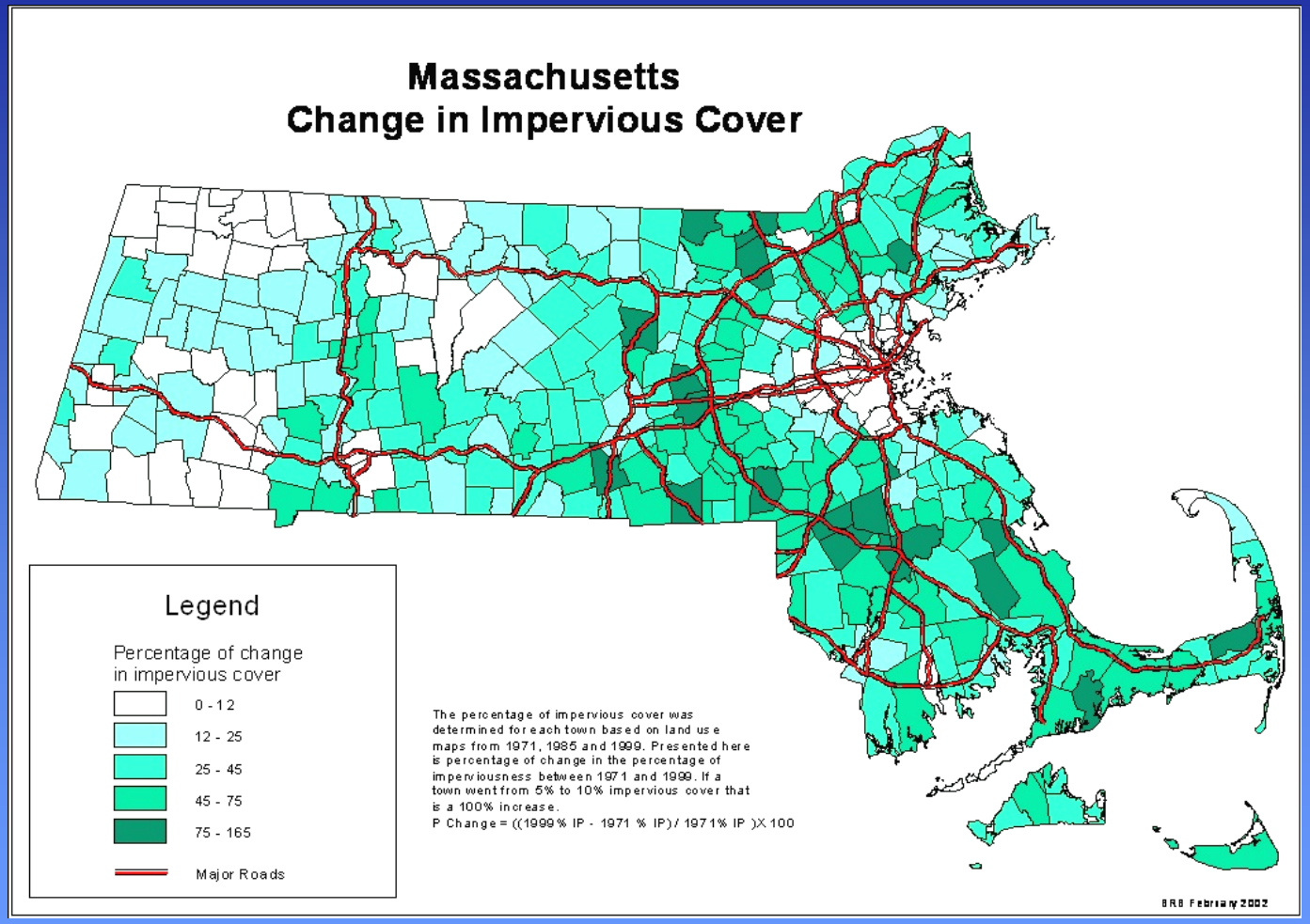
- Reductions in stormwater infiltration and groundwater recharge when stormwater enters municipal sewer collection system

Increasing Built-up Area



Urbanization of Watersheds

Water Imbalance



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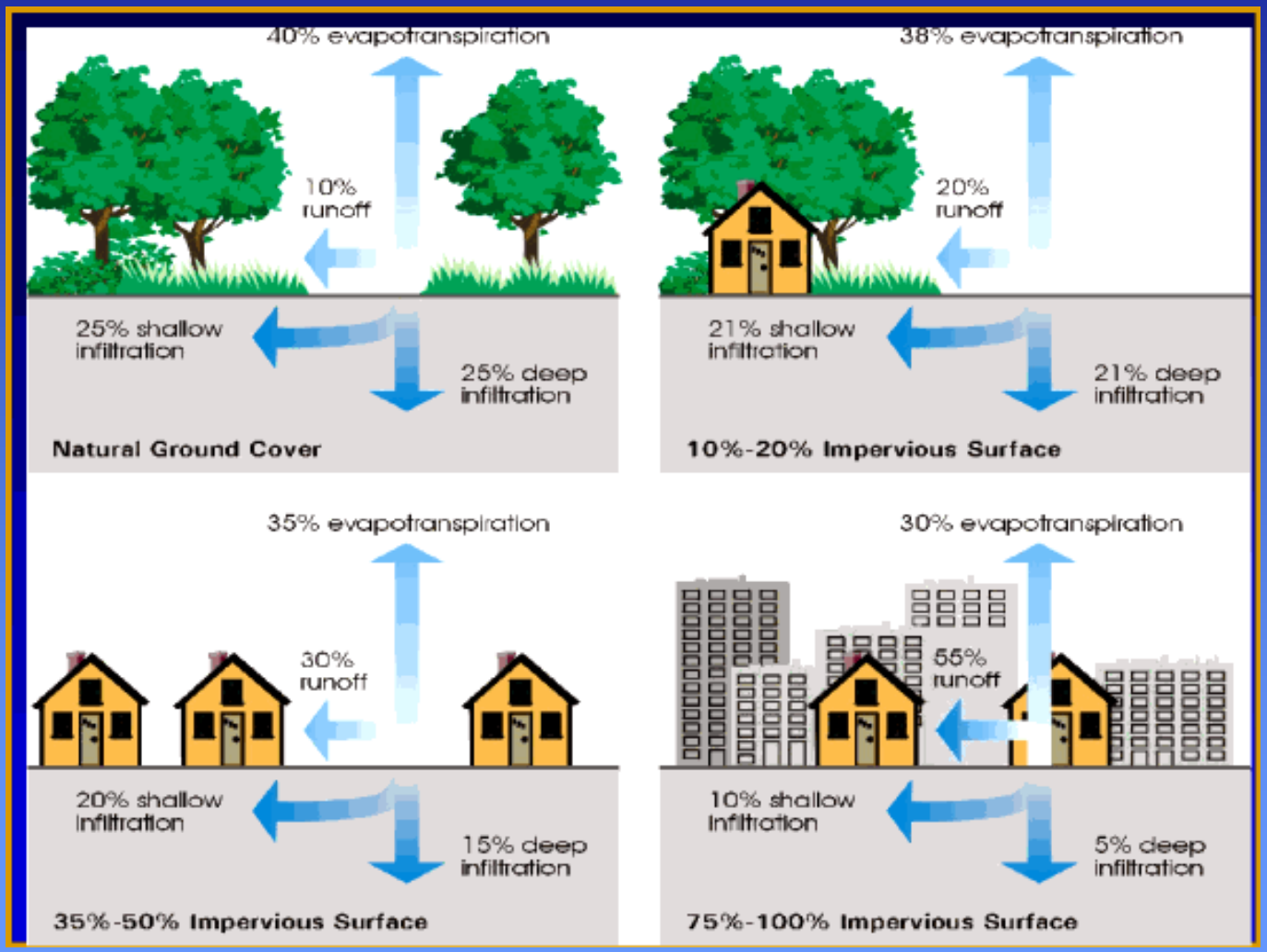
Factors affecting a Balanced Watershed Hydrologic Cycle

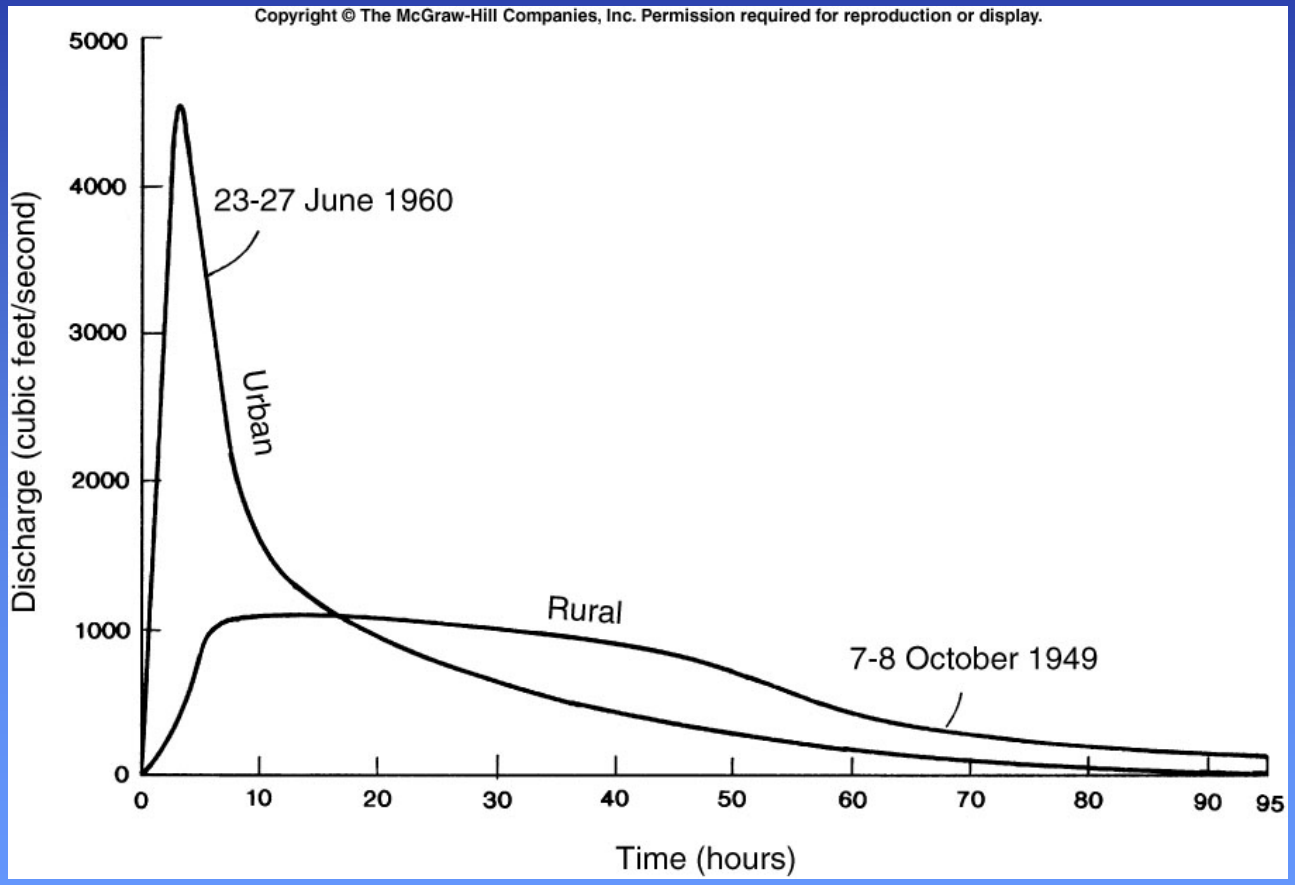
Impervious surfaces

- Increases runoff : Prevents aquifer recharge
- Reduces groundwater storage and base flows to rivers

Loss of Groundwater Recharge



Pre- and Post-Development Stormwater Runoff

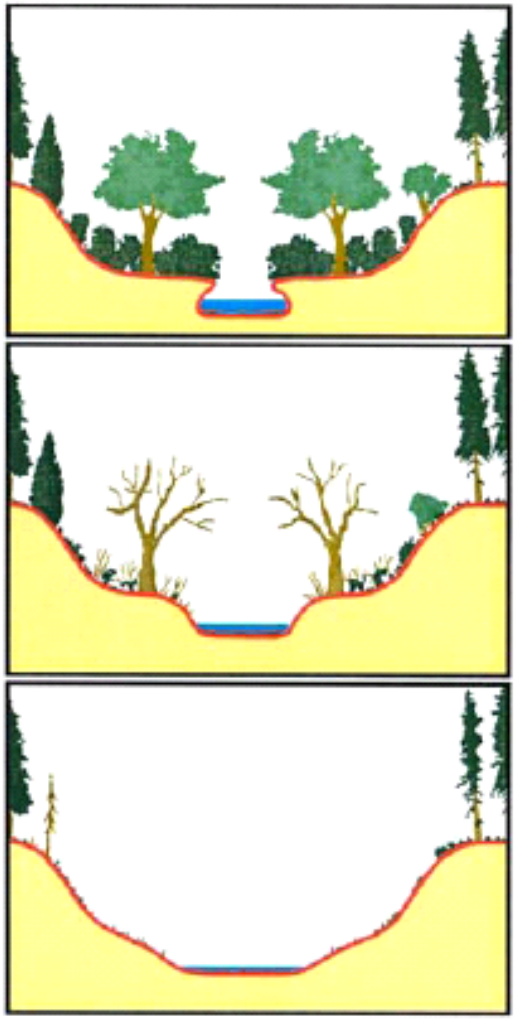


Loss of Groundwater Recharge

Summary: Post-Development Hydrologic Effect

- Disrupted natural water balance
- Increased flood peaks, storm water runoff, and bankfull flows
- More frequent flooding
- Lower baseflow to streams (less water in the stream)

Channel Degradation



Functioning channel

Downcutting and bank erosion have occurred.

Stream is very wide and shallow. This stream is not functioning.

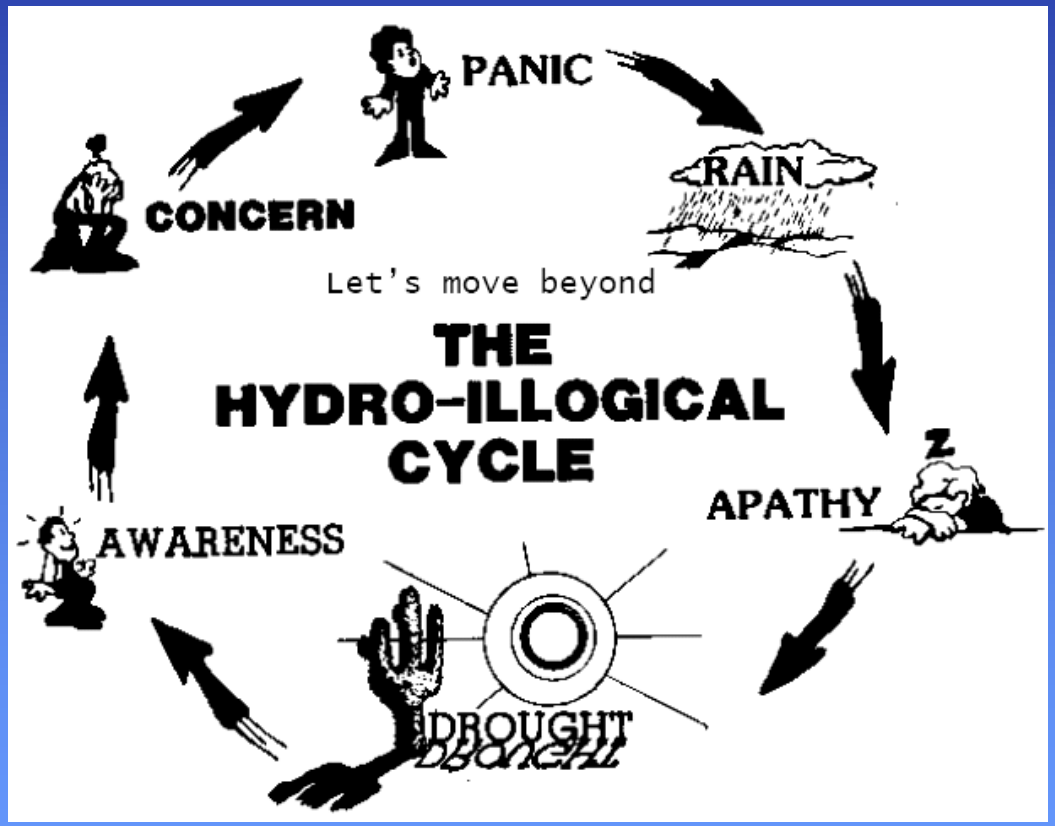
UNCE

This diagram shows the progression of stream channel degradation.

Variability in Water Balance

- Rainfall Yearly Average
- Land Use/Land Cover Affects on Groundwater Recharge

Water Withdrawal Challenges are Now !



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Water Withdrawal Challenges are Now !

- Increasing Annual Demand – Limited Focus on Water-Use Efficiency
- Urbanization of Watersheds – Receding Groundwater Elevations and Base Flow to Rivers, Streams, and Ponds
- Interbasin Transfers

DEP's Authority

MGL Chapter 21G

310 CMR 36.00

Water Supply

Water Quality

Agriculture

Waste Water

Hydropower

Balance

Navigation

Recreation

Wetland Habitat

Fish and Wildlife

Flood Plain

Agriculture

Groundwater Recharge

DEP's Authority

Managing Water Withdrawals to balance the needs by Man and the Environment

- Water Management Act: MGL 21G
- DEP Regulations: 310 CMR 36.00
  - Registrations
  - Permits

Water Balance Plan or Offset Feasibility Study

Is required of water suppliers in high and medium stressed basins whenever their water withdrawals exceed baseline.

Initiate Water Balance Feasibility Study

Required of Water Suppliers
in high & medium stressed basins

when:

- **withdrawals have exceeded baseline**
- **WMA water conservation requirements have been met:**
  - **65 gallons/person/day**
  - **10 % Unaccounted-for-Water**

Water Balance Planning
to preserve the Natural Hydrologic Cycle

Water Use Efficiency Program – Assessment

- Prioritize efforts to reduce consumption

Water Balance Planning

Assessing Watershed Offset Opportunities

Profile the Water Balance of Your Basin/Subbasin

- Survey Current Stormwater Management Practices
- Survey Current Wastewater Management Practices
- Propose mitigation measures

Mitigation measures

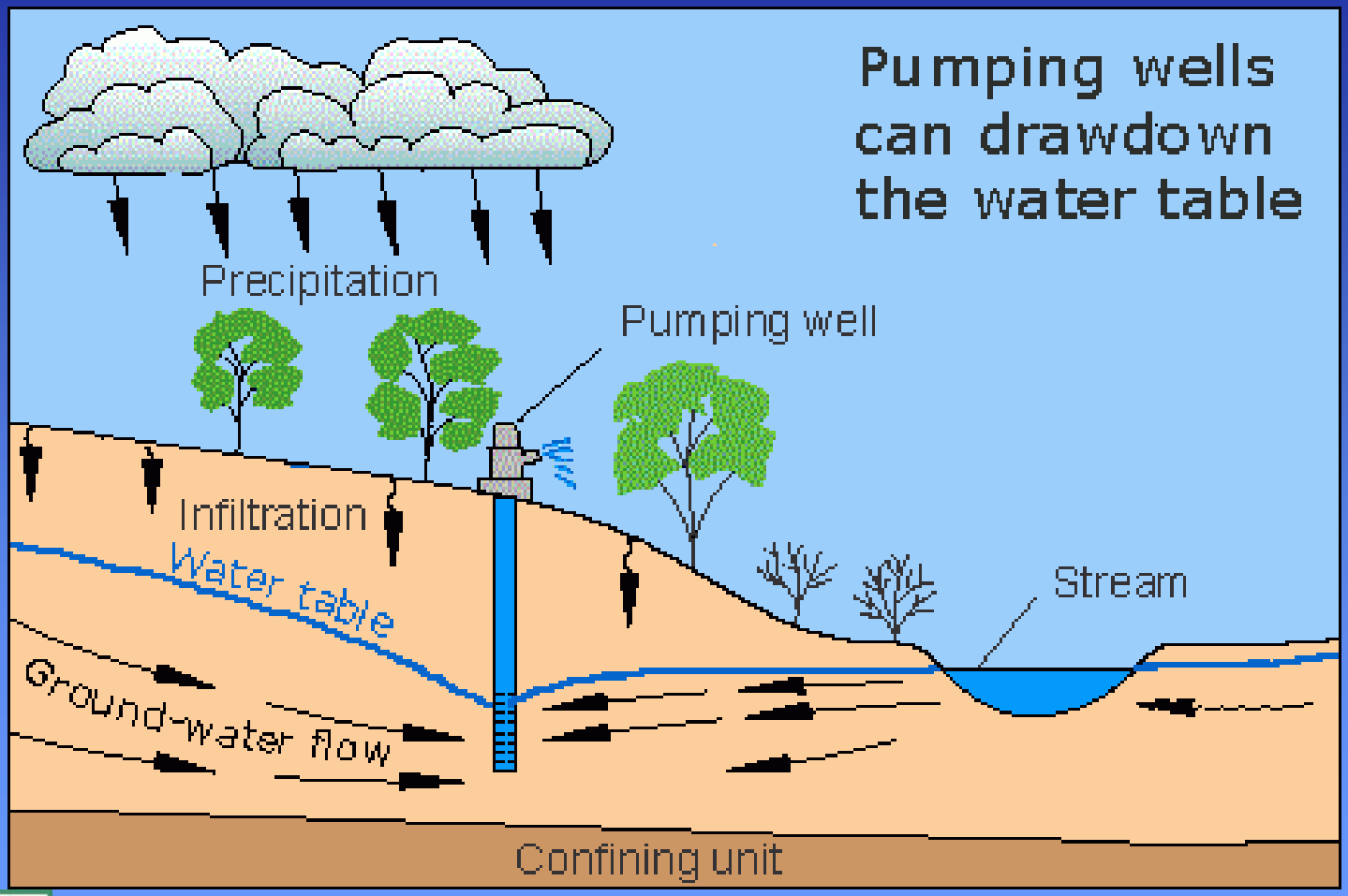
With a focus on those that do not cause more harm

Watershed Offsets Program

Mitigation Measures

- Wastewater Return
- Water Supply Source and Distribution System Management
- Infiltration and Inflow Removal
- Groundwater Recharge of Stormwater
- Regulation of Private Wells

Importance of Source Water Optimization



What is I/I

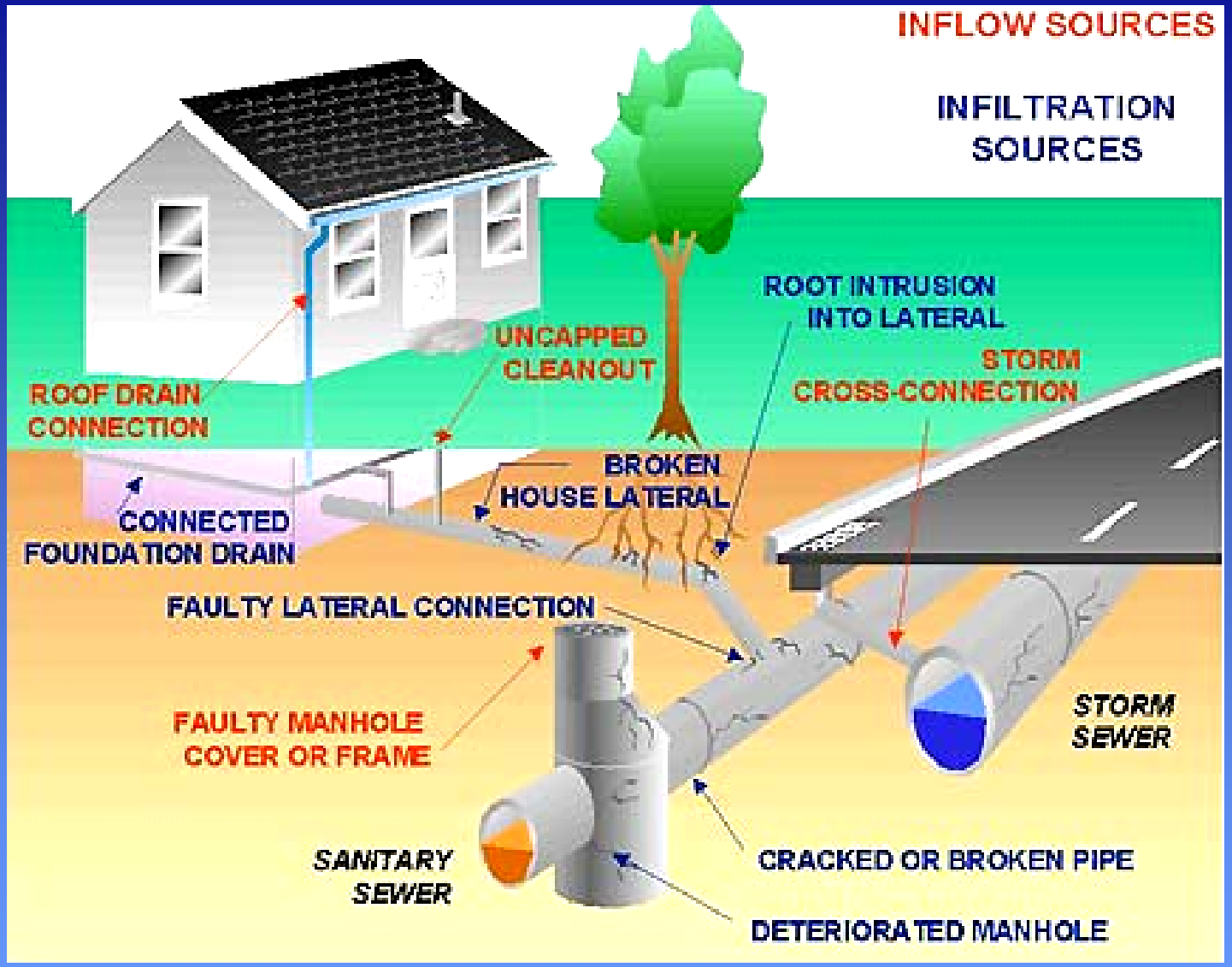
I/I = The total quantity of water from both infiltration and inflow without distinguishing the source.

Infiltration
(groundwater entering sewer & service connections)

- Cracks in pipes
- Unsealed pipe joints and connections
- Unsealed manhole walls or manhole joints

Inflow
(surface water discharged to sewers)

- Roof leaders
- Yard/area, sump pumps/foundation drains
- Cooling water discharges
- Drains from springs and swampy areas
- Manhole covers
- Cross connections from storm sewers
- Surface runoff; or drainage



Sources Of Water Inflow and Infiltration

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Water Re-Use – Municipal Systems

Use of Treated Sewage Effluent

- Golf Course Irrigation
- Municipal Landscaping
- Water features

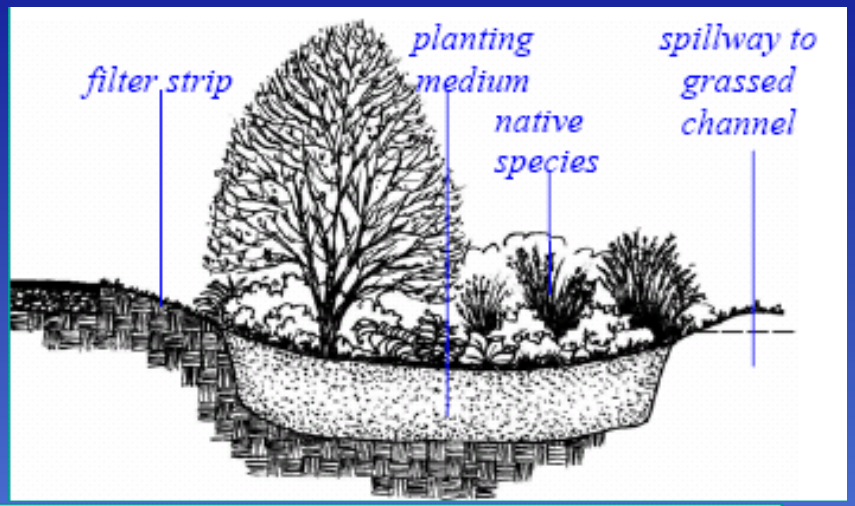
Water Re-Use – Personal Systems

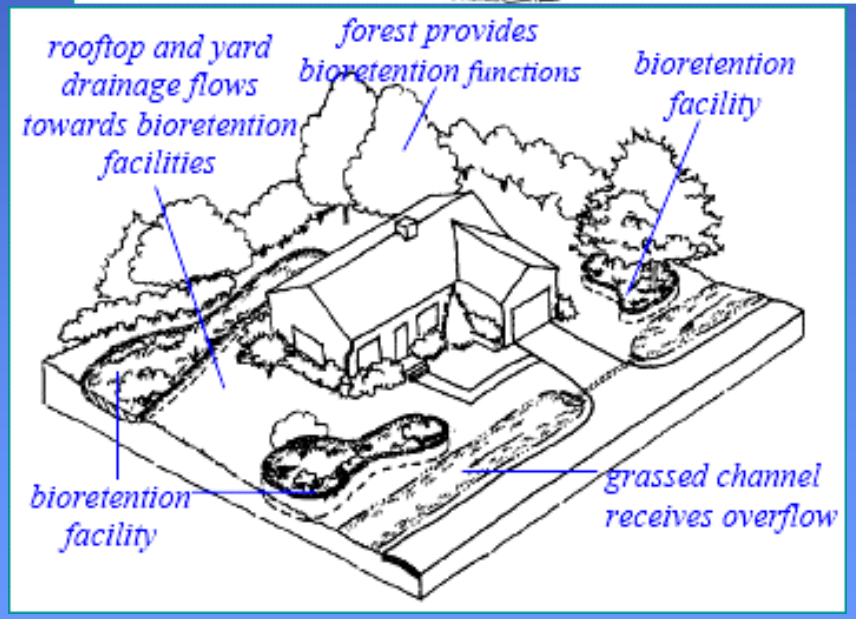
Capture of rainwater and grey water for landscape and irrigation

Use drainage water from roof top, washing machines, washing cars, etc. to irrigate landscaping

Low Impact Development

- Native Groundcover Landscaping
- Bio-retention
  - Islands
  - Linear
  - Benched
  - Under drained
- Filter Strips
- Rain Garden
- Fish Ponds
- Green Alleys





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Water Mitigation Trading

Aquifer Recharge, Storage and Recovery

Between Lower Basin (water-rich) and Upper Headwaters (water-poor) communities

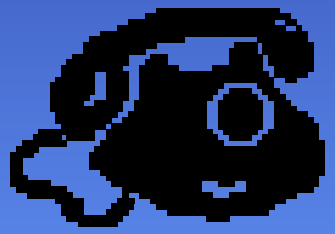
- Integrated Watershed Resource Mgt Plans
- Water Source Development and Sharing
- Waste Water Discharge, Reuse and Sharing
- Stormwater Recharge
- Others

Other Mitigations?

- Desalination (coastal)
- ?

For more information

- **Madelyn Morris**



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